

1.9.12

AI24BTECH11021 - Manvik Muthyapu

Question:

Find the length of the segment joining $A(-6, 7)$ and $B(-1, -5)$. Also, find the midpoint of \mathbf{AB} . (10, 2021)

Solution:

Variable	Description
\mathbf{A}	$\begin{pmatrix} -6 \\ 7 \end{pmatrix}$
\mathbf{B}	$\begin{pmatrix} -1 \\ -5 \end{pmatrix}$
\mathbf{M}	$\frac{\mathbf{A}+\mathbf{B}}{2}$

Length of line segment is $\|B - A\|$.

$$B - A = \begin{pmatrix} -1 \\ -5 \end{pmatrix} - \begin{pmatrix} -6 \\ 7 \end{pmatrix} \quad (1)$$

$$= \begin{pmatrix} 5 \\ -12 \end{pmatrix} \quad (2)$$

$$\|B - A\| = \sqrt{(B - A)^T (B - A)} \quad (3)$$

$$= \sqrt{(5)^2 + (-12)^2} = \sqrt{169} \quad (4)$$

$$= 13 \quad (5)$$

\therefore The length of line segment is 13 units.

Midpoint of line segment

$$M = \frac{A + B}{2} \quad (6)$$

$$= \frac{\begin{pmatrix} -6 \\ 7 \end{pmatrix} + \begin{pmatrix} -1 \\ -5 \end{pmatrix}}{2} = \frac{\begin{pmatrix} -7 \\ 2 \end{pmatrix}}{2} \quad (7)$$

$$= \begin{pmatrix} -3.5 \\ 1 \end{pmatrix} \quad (8)$$

$$\therefore M = \begin{pmatrix} -3.5 \\ 1 \end{pmatrix}$$

